

ratchet 40 the oscillating movement of the eccentric arm and pawl 41 will cause the spring to be wound, but when the collar is moved out of engagement with the ratchet
 5 40 power is not transmitted between the eccentric and the shaft 30, and at the same time the spring is free to unwind.

In order that the spring may be released to start the engine, means are provided for
 10 shifting the collar 44 out of engagement with the ratchet 40. This includes a rod 45 which is located above the shaft 30 and extends through both walls of the casing 10 to the forward end or face of the cover 33,
 15 where the shaft has a bearing in member 32 previously referred to. This shaft has secured to its forward end portion a shifter yoke 46 which engages in a groove of the collar 44, so that when the rod 45 is moved
 20 forwardly by the operator the collar 44 is moved out of engagement with the ratchet 40. This rod 45 may be connected to any suitable operating mechanism, such as a pedal or equivalent device, which is located
 25 within convenient reach of the operator when occupying the front seat of the vehicle. The rod 45 and collar 44,—in fact, all the parts which are shifted by the operator when he wishes the engine to be started,
 30 may be returned to the normal position as soon as the operator removes his foot from the pedal or otherwise releases said parts, by means of a coil spring 47 which surrounds the rod and bears at one end against
 35 the front wall of the casing and at its other end bears against a suitable shoulder on the rod.

It will be seen that when the collar is moved out of engagement with the ratchet
 40 40, the spring is free to turn the arbor and the shaft 11, and that when the spring is thus unwinding the gears 34 and 35 run freely driving only the shaft 30 of the winding mechanism, the eccentric and all other
 45 parts of the winding mechanism being then held stationary.

The releasing mechanism including the collar 44 which, as before stated, is adapted to be connected to the ratchet 40 by a tongue
 50 and groove connection, has the very important advantage that it will not reengage or form a driving connection with the ratchet 40 at a time when the collar is rotating at very high speed. A ratchet mechanism which has been utilized heretofore for
 55 forming driving connection between somewhat similarly arranged parts has the disadvantage that it is often the case that the rotation of the rotating part is arrested
 60 so suddenly and while said rotating part is rotating at such speed, that the parts are broken or otherwise injured. On the other hand, with my construction, if the operator releases his foot from the foot pedal while
 65 the spring is unwinding, and hence while

the collar 44 is rotating at high or fairly high speed, the inward movement of the collar toward the ratchet will not result in immediate engagement between the collar and ratchet wheel 40, for the reason that the
 70 groove and tongue are almost of the same width and one of the faces of the groove in the collar is slightly beveled, as will be seen from Fig. 5, and hence the collar will be thrown outward away from the ratchet
 75 by said beveled portion, unless the rotating speed of the collar is very low,—in fact sufficiently low as to permit the groove and tongue to become deeply engaged. This can only take place when the collar is rotating
 80 at a very low speed.

Having thus described my invention, what I claim is:

1. In a starter for the internal combustion engine of a motor vehicle, a casing, a main
 85 shaft extending into the same, and adapted to be connected to the engine shaft, a spring arbor within the casing, a spring extending about a portion of the arbor and having one end attached thereto and the other end stationary, means by which driving connection
 90 may be made between said arbor and the shaft, a winding shaft, mechanism for turning said shaft to wind the spring comprising a driving part carried by the main shaft, an
 95 eccentric adjacent said driving part, means by which driving connection is made between said driving part and the eccentric when the spring has been unwound a predetermined amount, means for transmitting
 100 power from said eccentric to said winding shaft, and means for causing the winding shaft to turn the arbor to wind the spring.

2. A starter for the engine of a motor vehicle, comprising a casing, a main shaft
 105 extending into the same, an arbor mounted on said shaft within the casing, a spiral spring surrounding a portion of the arbor and having its inner end attached thereto and its outer end held stationary, means by which
 110 driving connection may be made between said arbor and said main shaft, means for winding the spring comprising a winding shaft supported by the casing, power transmitting means between said winding shaft
 115 and the arbor, power transmitting means between said main shaft and the winding shaft comprising an eccentric, a driving part actuated by the main shaft and adapted to rotate said eccentric, ratchet mechanism between said eccentric and the winding shaft,
 120 and an automatic timing mechanism for making and breaking driving connection between said driving part and eccentric.

3. In a starter for the engine of a motor
 125 vehicle, a casing, a shaft extending therein, an arbor in the casing comprising a cylindrical part and two substantially parallel side walls having bearing flanges surrounding the shaft, a spring surrounding said cylin-
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